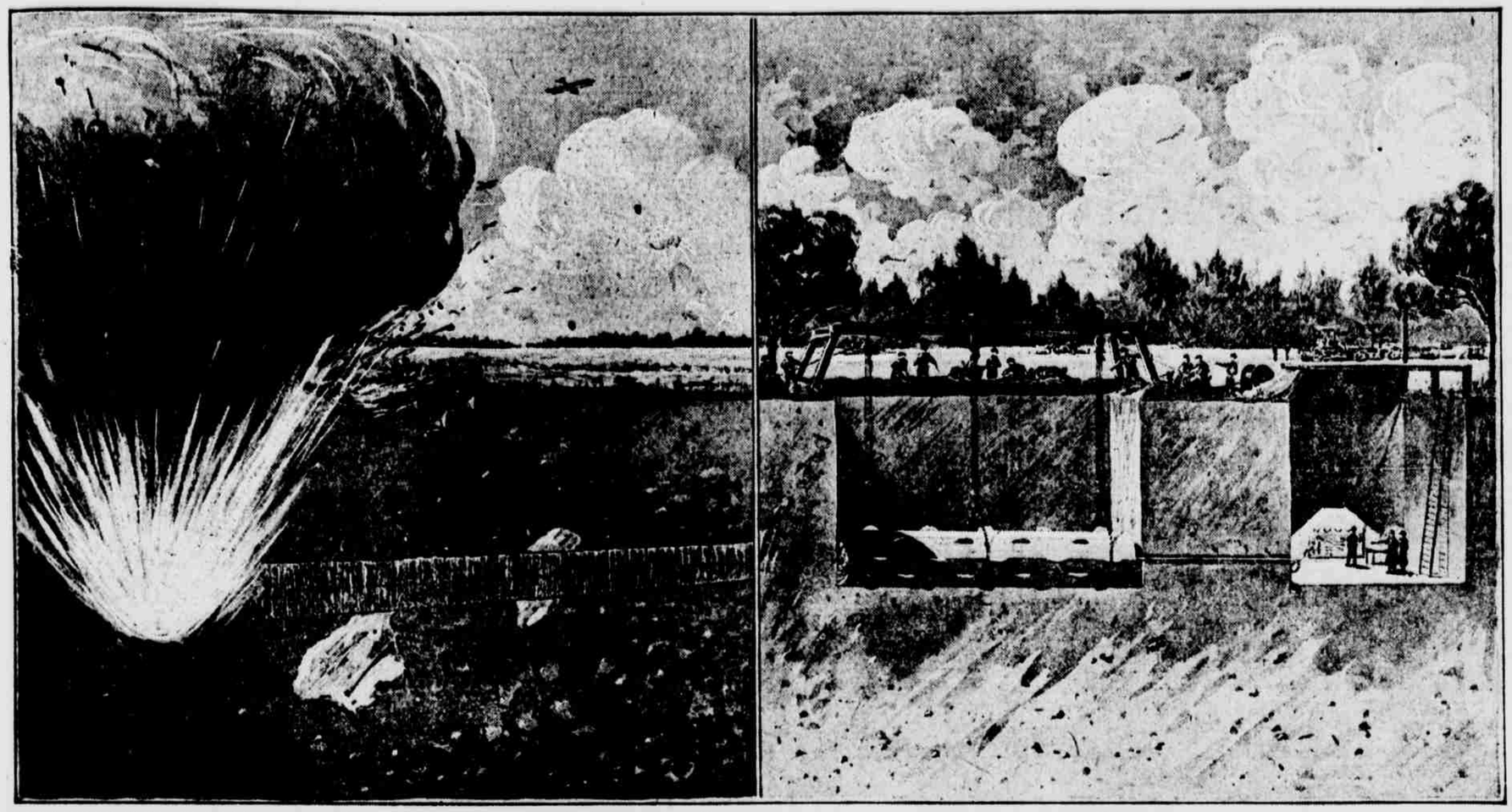
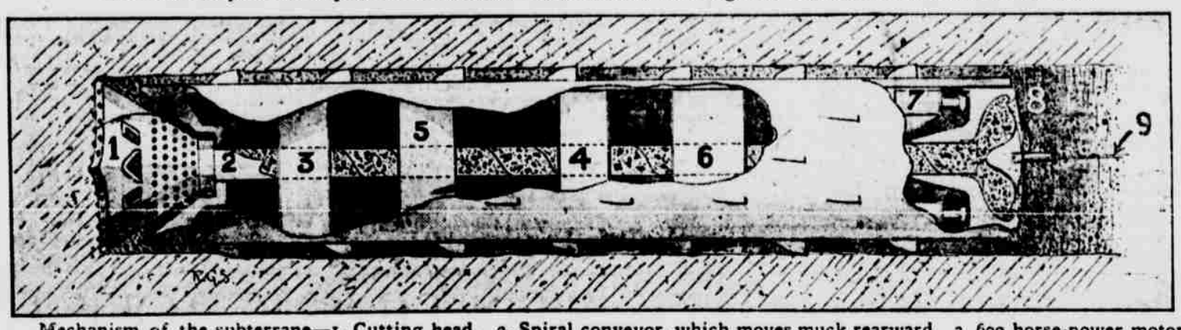
EARTH MOLE TORPEDO NEWEST PLAN FOR DEATH DEALING

Pacifist Inventor Believes It Will Revolutionize Land Fighting as Whitehead Did Sea Battles



The earth torpedo accomplishes its mission. Cross section showing how newest war terror would be used.



Mechanism of the subterrane—1. Cutting head. 2. Spiral conveyor, which moves muck rearward. 3. 600 horse-power motor, which operates cutting head and spiral conveyor. 4. 600 horse-power motor operating the rear plunger. 5. Explosive chamber. 6. Reel holding five miles of electric cable. 7. One of the four hydraulic jacks by which the rear plunger is forced outward and to the rear. 8. Plunger which packs the muck and shoves the subterrane forward. 9. Electric cable which reaches rearward to the power and control station.

THE surgeon styles himself a human benefactor, and yet his knife may hurt worse than the diseased tissues. Clifford P. Marye calls himself a pacifist, and this despite the fact that for many months his engineering skill has been centred upon the development of a new weapon of war.

Mr. Marye speaks of the weapon as the "subterrane." It may be described as a land torpedo which is intended to bore its way deep underground in a horizontal direction. Once properly aimed and started it can tunnel along to the seemingly secure position of a foe. Arriving at its destination, the throwing of a switch or the pressing of a key will suffice to send the electric impulse alone needed to detonate a score of tons of trinitrotoluol and thus to blow the enemy and the mightiest of his guns into bits. No reenforced concrete or steel armor could withstand a blast of that magnitude and least of all when attacked from beneath.

As the inventor says: "Suppose the foe should be able to learn that the subterrane was working its way certainly in his direction, what then? He can interpose no effective defence he can't halt it. If he doesn't want to be annihilated he will abandon his position, and he will probably do this too rapidly to withdraw his heavy guns. That will satisfy the purpose of the attacker.

"My pacifism plainly aims to make resistance so hazardous and the working of my subterrane so potentially terrible that armies will be thrust back from apparently impregnable points and carnage reduced to a minimum simply through a realization of the devastating might of my underground dirigible torpedo. Within its field of application I am satisfied that it will revolutionize fighting on land just as the Whitehead torpedo has profoundly modified the battle tactics of the sea.

"The purpose of the subterrane is to break the deadlock of trench warfare by giving to the side possessing the weapon the power to make rapid progress underground. The inspiration for the subterrane as it stands to-day was the grim struggle on the western front of the European war.

"It is designed to do what sappers and miners cannot achieve in the same time and under like conditions. It is also intended to do away with human agents in such perilous work, the torpedo making its journey unattended and yet every inch of the way being under the control of concealed operators.

"Have I ever accomplished anything of this sort before? Is the subterrane something more than an engineer's dream? In a military sense my underground torpedo is untried, but its mechanical features, by which progress can be made through the subsoil, have been proved to the satisfaction of myself and others.

"I know certainly that a properly constructed weapon will be able to bore its way through the underlying earth and carry along with it a great volume of explosive material. I know this because of experiments made by me here with comparatively crude apparatus. The last test took place a little more than a year ago down on Staten Island and upon the site of a part of the Silver Lake reservoir.

"My purpose in carrying out the test there was to attack a natural barrier that I had reason to believe would be cleared away and thus at a minimum of expense to me show me how far the experimental subterrane had travelled and what was its condition at the end of its journey. The excavation for the reservoir stopped before the subterrane was reached, but its path, uncovered for fifty feet, showed that it had functioned perfectly.

"Originally my mind was bent upon devising a tunnelling machine that would do away with manual labor, but after partly developing such an apparatus I abandoned further effort because I realized that the ultimate expense would exceed that involved in the employment of the pick and the shovel. However, my fundamental principles were mechanically correct and the present great conflict has shown how they can be utilized to advantage.

"Results are the things aimed at, and if time ever meant money its saving now should be worth millions of dollars if by recourse to a new weapon the struggle can be shortened. These are the conditions that now warrant the subterrane even though its use may seem at first blush to involve heavy outlays.

"The fish have guided us in the matter of marine propulsion, although we have found a rotary motion that will answer for the fins we cannot successfully imitate. The bird has inspired mechanical flight, and again we have substituted other impulses for the wonderful action of the wing. To nature also I went for my inspiration in this case. I got my idea of propulsion underground from creatures living in the earth—from the earthworm—and my problem has been to simulate its movements within the limitations of mechanical functions.

"Clearly the crux of the matter lay in attacking the earth not as a mass but as an aggregation of particles, not to clear away a pile of brick by shoving the lot bodily aside but by dealing with the individual brick. It is just in this way that the earthworm bores its path through the ground.

"It doesn't antagonize nature; it doesn't try to do the impossible. Particle by particle it ingests the earth ahead of it, eats its way along, and then digests the material and piles it up behind it. This in substance or effect is just what the subterrane does, and the 'spoils,' or 'muck,' as the debris is technically called, is passed to the rear and packed so firmly that it forms a footing or foundation against which to press in turn to shove the weapon forward.

"There is no tunnel left behind; instead the line of progress is marked by a core of compressed earth that is even more compact than the natural soil.

"Plainly, then, the subterrane is essentially an earth conquering invention and not a tunnelling machine, as the uninformed might imagine it offhand. As I have established by my tests, it will propel itself through earth, clay, sand, loose rocks, soft stone, &c., but it has not yet attacked hard ledge.

"I am convinced, however, that in its latest form it will be able of course at much slower speed, to cut its way through fixed hard stone. According to my calculations and the power provided the subterrane should be able to work forward at a rate varying from forty to one hundred feet an hour, or from one-sixth to one-half a mile during an operative day of twenty-four hours. The working depth is limited only by the geological formations likely to be encountered or by the military conditions confronting the operator choosing this form of attack.

"It is reasonably certain that the subterrane as I have now designed it would be able to travel underground for a distance of five or six miles, this limit being fixed by the size of the reel carrying the cable for supplying power and the maintenance of control and information circuits. As in the case of a gun or any other weapon, efficient operation and effective range will depend very largely upon the skill of the engineer in charge and his more or less complete knowledge of the ground to be penetrated and traversed.

"The subterrane is not like a mole. It gives or leaves no surface indication of its advance. No explosive is used in driving it onward, and its progress is to all outward purposes substantially noiseless.

"The object of a commander of armies is to reach his objective with the least delay. He is a success if he get there first, no matter the cost in lives and treasure; he is largely a failure if effectually baited, and his losses are then held up as a reproach. As I see it the practical value of the subterrane lies in the fact that it offers a safe means, so far as its operators are concerned, by which an enemy's trenches, positions, forts and even cities back of these defences may be destroyed.

"The foe cannot resist attack made in this way. It must be borne in mind that the subterrane can take an inclined course and travel deeper and advance faster than countermining for defence could be pushed, assuming that the foe knew of the underground torpedo's approach. The best protection is apt to be flight."

The question naturally is: How does Mr. Marye expect to accomplish these results? He has prepared detailed plans for subterranes of two sizes. The larger consists of a thick cast iron tube or cylinder 42 feet long and 8 feet in diameter; this is the shell of the burrowing torpedo. At the forward end or head there is a ponderous grinder consisting of two parts which rotate in opposite directions.

The surfaces of these two elements are studded with hundreds of cutting tools or points made of a grade of special steel which can do its best work when heated to a cherry red. Friction would induce this when the grinding, crushing or rending function is overcoming loose stones or gnawing through an immovable boulder or a section of a solid ledge.

Theoretically, the cutting head is a modified stone crusher, and naturally the rate of advance is dependent upon the character of the geological formation attacked. To operate these jaws Mr. Marye has planned to employ a 600 horse-power electric motor, and one of the distinctive features is the means adopted to facilitate low speed of revolution.

Inasmuch as the subterrane cannot be ventilated, his problem is to avoid high temperatures due to sustained action and the great frictional resistance to be encountered. Hence the low speed and the use of a porous grade of cast iron in the shell. In this way the radiating properties of the metal will hasten the dissipation of heat and transmit it to the enveloping soil.

The shell of the subterrane does not rotate, in fact means are provided to prevent this; it moves longitudinally and forward. To this end the outer surface has a great many fin-like projections, set with their thin edges in the line of advance so as to offer in that direction the least possible resistance. Their broad surfaces engage the surrounding earth formation and effectually check any turning movement that would be induced by the powerful motors operating other parts of the torpedo. Mr. Marye expects some of these fins to be torn from the shell as the weapon is urged onward, hence the number provided. Only a few of them are really necessary to steady the cylinder as it travels on its destructive journey.

The forward 600 horse-power motor, besides actuating the cutting head, also functions the spiral conveyor, which, like a single, primitive intestine, runs centrally from head to tail of the monster mechanical earthworm. In this way the ground ingested materials are carried rearward to another rotating element which has an important part to play. Here too second of the two 600 horse-power motors has its duty to perform in turning what is termed the revolving plunger.

The latter in effect is substantially a reverse turbine of extremely rugged setup. Its primary function is to take the muck or digested rock, roots, sand, clay, &c., reaching it by way of the spiral conveyor, and to pack the stuff in compressed layers closely behind the subterrane. As may be surmised, the plunger also has a longitudinal movement like a piston and the maximum extent of this is six feet.

This motion rearward—that of progression—is obtained by the operation of four hydraulic jacks, and the fluid pressure is furnished by four pumps driven by four 30 horse-power oil engines. This dual movement on the part of the revolving plunger or tail simulates the contraction and distention of a worm's body necessary to achieve progress.

To make these reciprocal operations clear, suppose the subterrane is about to begin its underground travel. First, a trench is dug into which the torpedo is lowered to the desired depth. This excavation would be about a foot longer than the shell and projecting head, but with the plunger withdrawn inside of the cylinder. The trench is dug so that the subterrane when lowered into it will point toward the desired target.

When thus aimed the four pumps are started and the revolvable tail or plunger is shoved by means of the four hydraulic jacks outward and to the rear. This movement soon brings the plunger's face against the back wall or end of the trench, and further effort on the part of the pumps serves to urge the subterrane forward. Then the great cutting head is started and the operation of shredding or grinding up the materials ahead is begun.

The muck passes into the subterrane's capacious maw and thence through the spiral conveyor to the discharge of the slowly rotating plunger or turbine. The latter spreads the digested stuff in disclike layers, exerting compression the while. As a result the plunger is gradually forced back within the shell by its own efforts and the strength of the rear 600 horse-power motor. In the meantime the cutting head has eaten forward something like five feet, and the great mechanical worm has contracted preliminary to reaching forward by distention.

Having built up for itself a footing to the rear, the four hydraulic jacks are again subjected to their maximum pressure by the working pumps, and slowly they tend to push the subterrane forward by shoving with all their might outward. This movement serves to advance the cutting head, with the entire shell, as the grinders gnaw their way through whatever obstacles confront them.

Again the building up process behind comes into play at the proper time, and thus, by alternate operations, the burrowing torpedo gnaws, digests and thrusts its way onward through the earth. The electric energy for these several efforts is furnished by a suitably located power station and transmitted by a cable wound upon a reel within the torpedo.

As the cable is paid out an associate mechanism is moved and in this way the distance travelled is electrically recorded at the starting point. So, too, any dip or deflection can be registered and Mr. Marye is satisfied that it will be possible to tell at any moment just where the torpedo is.

The inventor says: "Any obstruction in the path of the subterrane would be either smashed aside by the powerful hydraulic thrust developed or the obstacle would be destroyed. In no event would materials encountered seriously deviate the torpedo from its intended objective. While the subterrane would not last long enough to drill its way through a solid granite formation, still it would not be fooled by alternate layers of earth and stone or boulders of any size imbedded in earth."

It is evident that the various functions are not automatic, and it is equally clear that the different ones must be set in motion and the extent of them regulated to meet the character of the geological formations. How, then, can this control be exercised at a distance and without a human passenger inside of the subterrane to indicate the changing needs?

Mr. Marye has resource to a number of microphones properly placed at certain positions in the torpedo. These transmit to the operator in charge of the starting station sounds which tell him of the [illegible] know. His practised ear detects how things are working, [illegible] or starts to develop [illegible] these sounds.

In the 42 feet subterrane 100 cubic feet of space is provided for an explosive charge. It is estimated that within that compartment could be packed about 30,000 pounds of trinitrotoluol. This explosive is not affected by dampness and is the most powerful, besides being highly resistant to shock.

A weapon of this size would take four months to build and have an operative radius of two miles. The first one would cost approximately $75,000, but when manufactured in quantities the cost would be about $12,000 apiece. The [illegible] of torpedo [illegible]

Mr. Marye [illegible] amazing one, and yet [illegible] pro-hibitive. It will [illegible] if successful, would [illegible] more damage [illegible] yet employed in [illegible]

PARK DIRECTOR DISGUSTED WITH GUESTS

Conditions that aroused Director Hornaday's wrath. Above—Director Hornaday of the Bronx Zoological Park.

"Ten per cent. of the people of New York are indifferent to filth and dirt. Ten per cent. of the people who visit our parks are at heart human swine, who cannot be reasoned with or appealed to any more than you can convince a swine by argument. Nothing but force makes any impression upon their minds. We can have a clean city here in New York but, believe me, we have got to fight for it and keep fighting. I think we have here the dirtiest human element that exists in any American city.

"W. T. HORNADAY,
"Director of the Zoological Park, The Bronx."

"HUMAN swine" is a fairly strong term, but when approached on the subject of the letter printed above Mr. Hornaday was not willing to abate one whit of it. He declared the words were all too meagre to describe those offenders who desecrate the natural beauties of the Zoological Park by using it as a dumping ground for rubbish.

Mr. Hornaday was so intense on the subject that he pounded his desk until the plumage on the bird of paradise which perched above the rolltop fluttered, and the big oil cinnamon bear that romped across the wall to the right of him looked as if it was about to say "woof, woof!"

"I'm going to get these dirt distributors if it is the last act of my official career," he declared, "and when I do get them I will see they get theirs."

(Visions of iron gratings holding back the aforementioned "human swine.")

"It was away back in May, 1908, that I first began my campaign for clean parks," explained the irate director. "Previous to that time there was no organized effort to prevent persons from littering up the landscape with rubbish. It had come to the pass where something must be done if we were to preserve any of the natural beauty of these public playgrounds.

"Mayor Gaynor was asked to head a general movement looking to a betterment of conditions. He responded nobly. The papers were notified, and joined heartily in the campaign. Twenty-five of our city publications appealed to their readers to assist not only by observing the rules of decency and cleanliness themselves but by urging their neighbors to do likewise."

A city ordinance referring to this subject reads as follows:

"No person or persons shall throw, cast or lay any ashes, offal, vegetables, garbage, dross, cinders, shells, straw, paper, shavings, dirt, filth or rubbish of any kind whatever in any street, lane, alley or public place in the city of New York, nor shall any person cast or distribute in any public street, avenue or places of said city any handbills, circulars or advertising matter whatever, under penalty of not less than one nor more than five dollars for each and every offence."

Under the Gaynor regime the percentage of offenders of this kind in the public parks was reduced to 10 per cent., and there it has remained. To eliminate this last 10 is the problem that is keeping Director Hornaday up nights and causing his wrath to rise in great surging waves which threaten to dash the guilty up against the sharp crags of the law.

"We were almost in despair," he admitted, "when Mayor Mitchel came into office. Here was a young man, aggressive, unafraid. We begged him to lead a second campaign. It was our golden opportunity.

"Mayor Mitchel realized that there is a certain element among our citizenry instinctively lawless, dirty, defiant. It is useless to appeal to their civic pride, their esthetic taste, because they have none. They must be curbed with a club.

"The Mayor entered into the campaign with a vengeance. He ordered policemen to arrest violators and hale them to court. He called on the Police Commissioner and the Magistrates and told them that the letter of the law regarding park abuses must be carried out.

"The result was that from the first of May, 1915, hundreds of the lawless element were held and fined. Out of a catch of an even hundred offenders up for trial in a single court the Judge fined all but five, the amount being anywhere from $1 to $3.

"Women are especially difficult to handle. They will defy the officer, especially if they have children clinging to their skirts. They know an officer will do almost anything rather than drag them to court with their children, but when they refuse to give their names and get nasty they go, children and all."

Mr. Hornaday told with great glee how he had met the gay and festive peanut and worsted him.

"There was a time when any Monday morning you could stroll along the three miles of walk in the Zoological Park and find a solid fringe of peanut shells edging the sides and extending a distance of three feet out on the grass borders," he said. "It looked as if our old friend peanut was going to give me a losing battle. But we went after him. I tried to prevent the sale of peanuts in the shell at the nine stands near the park entrances, but found this could not be done.

"What I did do was to incorporate in the park rules a clause forbidding the bringing of peanuts into the park. To-day any person who brings or eats peanuts in the shell in the park is liable to arrest. You can walk from one end of the park to the other any Monday morning and not find on the walks enough rubbish to fill a waste paper basket."

Right at this point the director tackled the real business of the day. He spoke of the park benches, and with every passing word he became more eloquent, more violent, more threatening. This is a sore subject very near to his heart.

"There is one evil we have been unable to root out up to now," was the burden of his plaint, "but it will be rooted if we have to remove every bench in the park to do it.

"It has been our purpose all along to make the people who come to the park comfortable and happy, to give them pleasure. With this object in mind we placed at their disposal between 250 and 300 park benches. These benches occupy the choice spots in the park, the sites being chosen with a view to obtaining picturesque scenery and cooling shade.

"And now we come to the human swine and their habits. They select a sheltered spot and after they have lunched they either sneak papers, greasy boxes, fruit peelings, egg shells, bottles under the bench or toss them over their shoulders. Why they go to all the trouble to do this when there are rubbish cans within not more than forty feet of them is a problem I cannot solve unless it is that they live in filth and dirt at home and are too lazy and shiftless to walk to the containers.

"Signs in four different languages—English, German, Yiddish and Italian—are posted everywhere warning them they will be liable to arrest, yet they go to all the pains to conceal rubbish under their skirts rather than obey the law. Even the plain clothes men Mayor Mitchel has assigned to the park service have been unable to catch them.

"There is only one thing left to do. As fast as I find a bench is being abused I will have it removed. If necessary I will take away every bench in the park. New York has some of the most beautiful and completely equipped parks in the world. It is up to her good citizens to protect and preserve them."

Director Hornaday has had numerous letters suggesting all sorts of remedies for the bench rubbish evil. One man though it might be an excellent idea to adopt the rules in force in San Francisco parks and bar all lunches from the grounds.

"I know of no better word to describe the person who litters up our parks than one common in the West—ornery. "I'm after the ornery 10 per cent," said Mr. Hornaday in conclusion.

On the way out a mother deliberately took a banana peel from her three-year-old and tossed it over at one of the busy little beavers which was building a dam for himself in one of the park lakes. Is or is not Director Hornaday's ire justifiable?